PATENT ABSTRACTS OF JAPAN

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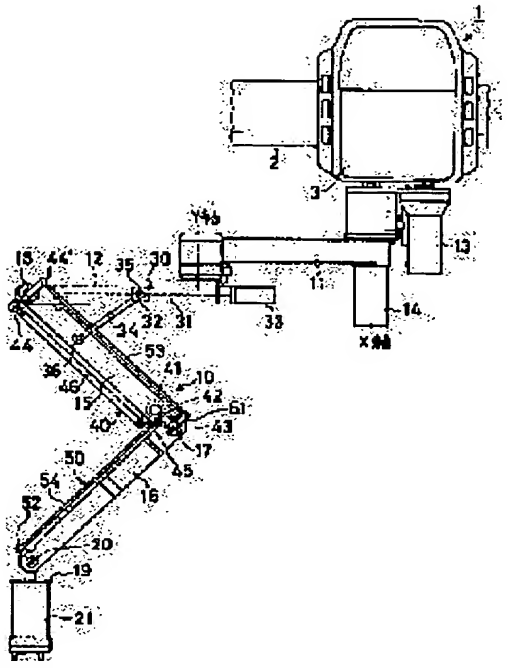
(54) TRANSPORT DEVICE

(57) Abstract:
PURPOSE: To provide a small sized transport device which can secure the large working range.
CONSTITUTION: The X-axis arm 11 and Y-axis arm 12 which are connected each other and turn in a horizontal plane are arranged on a device body 3, and a robot arm 10 is installed on the Y-axis arm 12. When the X-axis arm 11 and the Y-axis arm 12 are turned in the horizontal plane, the working range of the robot arm 10 is widened. Further, the X-axis arm 11 is extended in the traveling direction of a transport device 1, and the Y-axis arm 12 is turned for the X-axis arm 11, and a tool 21 supported on the robot arm 10 is positioned directly under a device body 3, and then the center of gravity of the tool 21 and the center of gravity of the body 3 coincide with each other, and the transport device 1 is prevented from being applied with an eccentric load, and the traveling space of the transport device 1 can be reduced.



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(57) [Abstract]
[Objects of the Invention] The transport device which can secure the small and big work range is offered.
[Elements of the Invention] The X-axis which is mutually connected with the main part 3 of equipment, and rotates the inside of the level surface, and the Y-axis arms 11 and 12 are formed, and the robot arm 10 is attached in the Y-axis arm 12. If the X-axis arm 11 and the Y-axis arm 12 are rotated in the level surface according to this invention, the work range of the robot arm 10 will be

expanded. Moreover, if it is made for the tool 21 which took out the X-axis arm 11 in the run direction of a transport device 1, was made to rotate the Y-axis arm 12 to this X-axis arm 11, and was supported by the robot arm 10 to be located directly under the main part 3 of equipment, since the center of gravity of a tool 21 and the center of gravity of a main part 3 are in agreement, an unbalanced load cannot act on a transport device 1, but the run space of this transport device 1 can also be stopped small.

[Claim(s)]
[Claim 1] The transport device characterized by being equipment it runs along with a rail, having an X-axis arm rotating around the inside of the level surface, and constituting a robot arm in preparation for this X-axis arm.
[Claim 2] The transport device characterized by being equipment it runs along with a rail, having the X-axis which is connected mutually and rotates the inside of the level surface, and a Y-axis arm, and constituting a robot arm in preparation for a Y-axis arm.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the transport device it runs along with a rail.
[0002]
[Description of the Prior Art] For example, in the assembly line of works, conveying parts automatically to a predetermined place by the transport device is performed. That is, the elevator style which moves vertically the transfer equipment which transfers parts, and parts to the transport-device main part (conveyance train) which runs by himself along with a rail is prepared, and if the transport device which supported parts moves to a predetermined place, parts will be taken down by the elevator style and will be transferred to other equipments etc. by the transfer equipment.
[0003]
[Problem(s) to be Solved by the Invention] By the way, although it is necessary to attach the equipment of exclusive use for it in order to make work other than conveyance of parts do on a transport device, the equipment is small wanted to be foldable so that the big work range may be secured in a small top and trouble may not be caused to movement of a transport device.
[0004] Therefore, the place made into the purpose of this invention is to offer the transport device which can secure the small and big work range.
[0005]
[Means for Solving the Problem] this invention is characterized by having prepared the X-axis arm rotating around the inside of the level surface in the transport device it runs along with a rail, and equipping it with a robot arm at this X-axis arm that the above-mentioned purpose should be attained.
[0006] Moreover, this invention prepares the X-axis which is mutually connected with the transport device it runs along with a rail, and rotates the inside of the level surface, and a Y-axis arm, and is characterized by equipping a Y-axis arm with a robot arm.
[0007]
[Function] If an X-axis arm or an X-axis arm, and a Y-axis arm are rotated in the level surface according to this invention, the work range of the robot arm with which these were equipped will be expanded.
[0008] Moreover, if an X-axis arm is made in agreement in the run direction of a transport device during a run of a transport device, run space can be stopped small.
[0009] Furthermore, if it is made for the load which took out the X-axis arm in the run direction of a transport device, was made to rotate a Y-axis arm to this X-axis arm, and was supported by the robot arm to be located directly under the center of gravity of a transport device, since the load center of gravity and the center of gravity of a transport device are in agreement, an unbalanced load cannot act on a transport device, but deformation of this transport device, an inclination, etc. can be prevented.
[0010]
[Example] The example of this invention is explained based on an accompanying drawing below.
[0011] The side elevation of the transport device which drawing 1 requires for this invention, operation explanatory drawing of a robot arm in which drawing 2 is prepared in this transport device, drawing in which drawing 3 shows the work range within the flat surface of a robot arm, drawing 4 ,

and drawing 5 are the front view of a transport device showing the state where the robot arm was folded up.

[0012] The transport device 1 shown in drawing 1 attaches the robot arm 10 in the main part (conveyance train) 3 which runs by himself along with a monorail 2, and is constituted.

[0013] The above-mentioned robot arm 10 has the X-axis arm 11 and the Y-axis arm 12 which each other are connected by the Y-axis and rotate the inside of the level surface, and as it drives by the X-axis motor 13 and is shown in drawing 3 focusing on the X-axis of illustration, as for the X-axis arm 11, it rotates the inside of the level surface in [angle] 210 degrees. Moreover, as for the Y-axis arm 12, the inside of the level surface is rotated in [angle] 270 degrees, as it drives by the Y-axis motor 14 and is shown in drawing 3 focusing on the Y-axis of illustration.

[0014] On the other hand, in drawing 1 , it is the 1st and the 2nd arm which 15 and 16 are mutually connected with the pivot shaft 17, and rotate the inside of a vertical plane, and the edge of the 1st arm 15 is connected with the point of the aforementioned Y-axis arm 12 free [rotation] with the pivot shaft 18 like illustration. Moreover, the tool plate 19 is connected with the free end of the 2nd arm 16 free [rotation] with the pivot shaft 20, and the tool 21 which does predetermined processing work is attached in this tool plate 19. In addition, the aforementioned pivot shaft 17 rotates with the 2nd arm 16, the pivot shaft 18 rotates with the 1st arm 15, and the pivot shaft 20 rotates it with the tool plate 19 and a tool 21.

[0015] By the way, in the aforementioned Y-axis arm 12, the ball-thread mechanism 30 which is a drive for rise and fall is built in, and this ball-thread mechanism 30 is constituted including the ball thread 31 allotted in the length direction of the Y-axis arm 12 free [rotation], the slider 32 screwed in this ball thread 31 free [an attitude], and the drive motor 33 which carries out the rotation drive of the ball thread 31.

[0016] The end of the drive bar 34 is pivoted free [rotation] with the shaft 35, and the other end of this drive bar 34 is pivoted in the pars intermedia of the 1st arm 15 of the above by the slider 32 of the above-mentioned ball-thread mechanism 30 free [rotation] with the shaft 36.

[0017] Moreover, the driving mechanism 40 which transmits rotation of the 1st arm 15 to the 2nd arm 16, and the posture maintenance mechanism 50 for always holding the posture of the aforementioned tool plate 19 and a tool 21 in the perpendicular state are formed in the above 1st and the 2nd arm 15 and 16.

[0018] Here, if the composition of the above-mentioned driving mechanism 40 is explained, this driving mechanism 40 has the gears 41 and 42 of the size different diameter supported by the 2nd arm 16 side-edge section of the 1st arm 15 free [rotation], and the gear 43 of the minor diameter bound to the aforementioned pivot shaft 17, as shown also in drawing 2 . In addition, gears 41, 42, and 43 have geared mutually and the gear ratio of the gear 41 of a major diameter and the gears 42 and 43 of a minor diameter is set as 2:1.

[0019] Moreover, arms 44 and 45 are bound to the portion and the aforementioned gear 41 which support the aforementioned pivot shaft 18, and both the arms 44 and 45 are connected with the link bar 46.

[0020] Next, the composition of the aforementioned posture maintenance mechanism 50 is explained.

[0021] In this posture maintenance mechanism 50, it is the arm which protruded on the portion into which 44' supports the aforementioned pivot shaft 18, the arm of L typeface attached by 51 free [rotation on the aforementioned pivot shaft 17], and the arm with which 52 was bound to the aforementioned pivot shaft 20, and arm 44' and an arm 51 are connected by the 1st posture link 53, and the arm 51 and the arm 52 are connected by the 2nd posture link 54.

[0022] Here, it explains, referring to drawing 2 about movement within the 1st and an operation of the 2nd arm 15 and 16, i.e., the vertical plane of the tool 21 which is a workplace.

[0023] In the state where the 1st and the 2nd arm 15 and 16 are in the real line position of drawing 2 , the drive motor 33 of the aforementioned ball-thread mechanism 30 is driven, a ball thread 31 is rotated in the predetermined direction, and if the slider 32 screwed in this ball thread 31 is moved in the direction of illustration arrow a, the 1st arm 15 will rotate only an angle theta 1 from real line position to a chain-line position centering on the pivot shaft 18. Then, rotation of this 1st arm 15 is transmitted to the 2nd arm 16 by the driving mechanism 40. That is, rotation of only the angle theta 1

of the 1st arm 15 is transmitted to a gear 41 through the link bar 46 and an arm 45, only the amount of said is rotated in the direction same as this gear 41, rotation of this gear 41 is transmitted to a gear 43 through a gear 42, and the 2nd arm 16 bound to this gear 43 rotates only an angle theta 2 to a chain-line position counterclockwise centering on the pivot shaft 17. Since the gear ratio of a gear 41 and gears 42 and 43 is set as 2:1 as mentioned above at this time, The amount of rotation of the 1st arm 15 is amplified by double precision, and is transmitted to the 2nd arm 16. The tool 21 which the relation of theta2=2xtheta1 was always materialized among the rotation angles theta1 and theta2 of both the arms 15 and 16, therefore was attached in the edge of the 2nd arm 16 is made to descend the work line L top of illustration from the real line position A to the chain-line position B. In addition, the posture of the tool 21 at this time is always kept perpendicular by the posture maintenance mechanism 50.

[0024] Moreover, it sets in the state where the 1st and the 2nd arm 15 and 16 are in the real line position of drawing 2 . If a ball thread 31 is reversed and a slider 32 is moved in the direction of illustration arrow b The 1st arm 15 is counterclockwise rotated to a dashed line position centering on the pivot shaft 18. Like the above-mentioned, rotation of this 1st arm 15 is amplified by double precision, and is transmitted to the 2nd arm 16 by the driving mechanism 40. The 2nd arm 16 rotates to a dashed line position clockwise centering on the pivot shaft 17, consequently a tool 21 goes up the work line L top from the real line position A to the dashed line position C. In addition, the posture of a tool 21 is kept perpendicular by the posture maintenance mechanism 50 also at this time.

[0025] Thus, by moving the end of the drive bar 34 along with the Y-axis arm 12 according to the ball-thread mechanism 30, the 1st and the 2nd arm 15 and 16 are made to rotate the inside of a vertical plane, and the tool 21 attached in the free end of the 2nd arm 16 moves the work line L top vertically.

[0026] In addition, although the composition to which the end of the drive bar 34 is moved along with the Y-axis arm 12 was adopted in this example, the ball-thread mechanism 30 may be formed in the 1st arm 15 side, and the composition to which the 1st arm 15 side-edge section of the drive bar 34 is moved along with the 1st arm 15 may be adopted.

[0027] It rotates in the angle range which the X-axis arm 11 shows to drawing 3 focusing on the X-axis on the other hand if the X-axis motor 13 is driven in drawing 1 as mentioned above. Since the Y-axis arm 12 will rotate in the angle range shown in drawing 3 focusing on the Y-axis if the Y-axis motor 14 is driven, the point section (namely, tool 21 which moves the work line L top vertically) of the Y-axis arm 12 can move within the limits of the slash portion shown in drawing 3 within a flat surface.

[0028] Therefore, if the X-axis, the Y-axis arms 11 and 12 and the 1st, and the 2nd arm 15 and 16 are driven simultaneously, the tool 21 which is a workplace can move arbitrarily in 3-dimensional space, and can do necessary work.

[0029] It ** and the moving range in the level surface of a tool 21 becomes what compounded the moving range of the X-axis and a Y-axis arm (slash field of drawing 3), and since the moving range within a vertical plane becomes the 1st and the thing which compounded the moving range of the 2nd arm, a big moving range is secured to this tool 21 in 3-dimensional space.

[0030] Moreover, since rotation of the 1st arm 15 is made by moving the end of the drive bar 34 according to the ball-thread mechanism 30, it can make it able to rotate under small power as compared with the case where this 1st arm 15 is directly rotated with motor torque, and can attain the miniaturization of a drive motor 33.

[0031] furthermore, in case a transport device 1 moves along with a monorail 2 Since the 1st arm 15 can be folded up and contained in the Y-axis arm 12 and the 2nd arm 16 can be folded up on the outside of the 1st arm 15, as shown in drawing 4 , A transport device 1 may be moved where the whole robot arm is folded up small, it cannot cause trouble to movement of this transport device 1, and can secure a big space above the Y-axis arm 12.

[0032] Or while an unbalanced load will not act on a transport device 1 but the inclination of this transport device 1 and deformation will be prevented since the center of gravity of a tool 21 and the center of gravity of the transport-device main part 3 are in agreement if this folds up the Y-axis arm 12 in the direction which laps with the X-axis arm 11 as shown in drawing 5 , run space can be

stopped small.
[0033] As a state at the time of still more desirable movement, like drawing 6 , if the direction of each folded-up arms 11, 12, 15, and 16 is made to agree in the run direction (the direction of a rail 2) of a transport device 1, a place cannot be taken in the run direction and the direction which intersects perpendicularly, but run space can be stopped small.
[0034] In addition to the structure of the above-mentioned example, drawing 7 or drawing 9 shows the example in which the load mitigation mechanism 60 which gives the force of the pull-up direction to the ** sake which mitigates the load which joins the drive for rise and fall of the aforementioned ball-thread mechanism 30 grade at tool supporting section was formed. According to the stability of the board volume spring 61 drawn from the drum 62, the above-mentioned load mitigation mechanism 60 makes hoisting power act on the tool plate 19, and has the following structures.
[0035] that is, the bracket 63 of a couple and 63' fix to the point of the aforementioned Y-axis arm 12 -- having -- this bracket 63 and 63' -- the above-mentioned drum 62 is supported free [rotation] by the shaft 64 attached in between While the board volume spring 61 is twisted around this drum 62, the nose-of-cam side of the board volume spring 61 is drawn from a drum 62, it is prolonged below, and the nose of cam of the board volume spring 61 is connected to the piece 67 of anchoring which has fixed on the above-mentioned tool plate 19. In addition, the setscrew with which 65 attaches the above-mentioned shaft 64 in a bracket 63 and 63', and 66 are colors arranged to shaft 64 periphery section ends.
[0036] If such a load mitigation mechanism 60 is established, the winding-up force shown by the arrow will act on drawing 7 and drawing 9 according to the stability the board volume spring 61 tends to coil around a drum 62. And if there is no above-mentioned load mitigation mechanism 60, although the load by arms 15 and 16 and the tool 21 and the load of a work held further at a tool 21 will join the above-mentioned drive for rise and fall, the above-mentioned load is negated or it is mitigated by the winding-up force of the above-mentioned board volume spring 61. Therefore, it is mitigated sharply and the load of a drive motor 33 becomes advantageous to a miniaturization, power consumption reduction, etc. of a drive motor 33.
[0037] Incidentally, if the load by the above-mentioned arms 15 and 16 and the tool 21 sets to about 2kg, about 5kg is suitable for the winding-up force with the above-mentioned **** spring 61.
[0038] In addition, although considered as the composition which forms the X-axis arm 11 and the Y-axis arm 12 in the transport-device main part 3, and equips the Y-axis arm 12 with the robot arm 10 in the above example, only the X-axis arm 11 is formed and the effect same also as composition which equips this X-axis arm 11 with the robot arm 10 as an example is acquired.
[0039]
[Effect of the Invention] If an X-axis arm or an X-axis arm, and a Y-axis arm are rotated in the level surface by the above explanation according to this invention so that clearly, the work range of the robot arm with which these were equipped is expandable.
[0040] Moreover, if an X-axis arm is made in agreement in the run direction of a transport device during a run of a transport device, run space can be stopped small.
[0041] Furthermore, if it is made for the load which took out the X-axis arm in the run direction of a transport device, was made to rotate a Y-axis arm to this X-axis arm, and was supported by the robot arm to be located directly under the center of gravity of a transport device, since the load center of gravity and the center of gravity of a transport device are in agreement, an unbalanced load cannot act on a transport device, but deformation of this transport device and an inclination can be prevented.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the side elevation of the transport device concerning this invention.
[Drawing 2] It is operation explanatory drawing of the robot arm prepared in the transport device concerning this invention.
[Drawing 3] It is drawing showing the work range within the flat surface of a robot arm.
[Drawing 4] It is the front view of a transport device showing the state where the robot arm was folded up.
[Drawing 5] It is the front view of a transport device showing the state where the Y-axis arm was folded up.
[Drawing 6] It is drawing showing the desirable example of the state at the time of transport-device movement especially.
[Drawing 7] It is the side elevation of a transport device showing another example.
[Drawing 8] It is the enlarged vertical longitudinal sectional view of the board volume spring winding portion of a load mitigation mechanism.
[Drawing 9] It is the center-section cross section of a drum and a board volume spring.
[Description of Notations]
1 Transport Device
2 Monorail (Rail)
10 Robot Arm
11 X-axis Arm
12 Y-axis Arm
15 1st Arm
16 2nd Arm
30 Ball-Thread Mechanism
34 Drive Lever
40 Driving Mechanism

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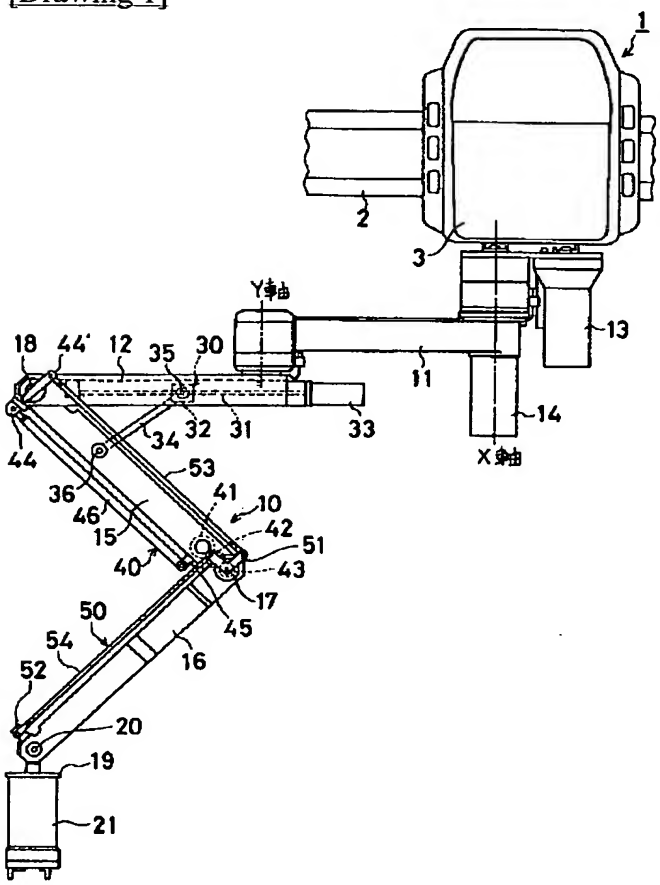
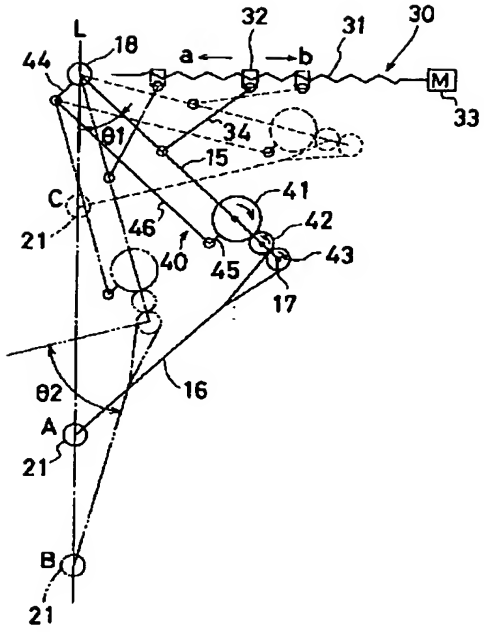
DRAWINGS

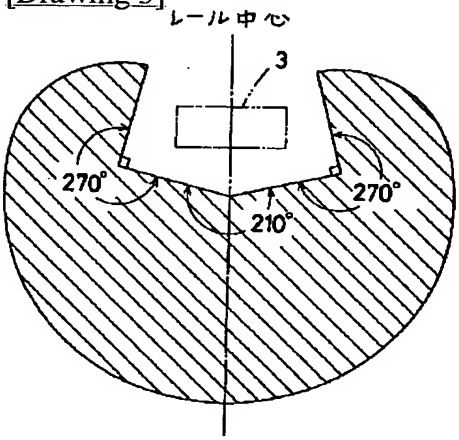
[Drawing 1]



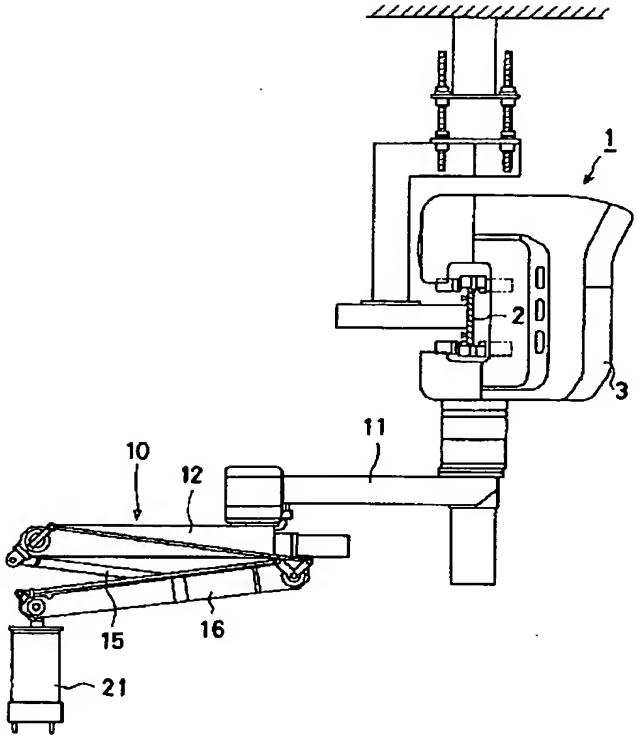
[Drawing 2]



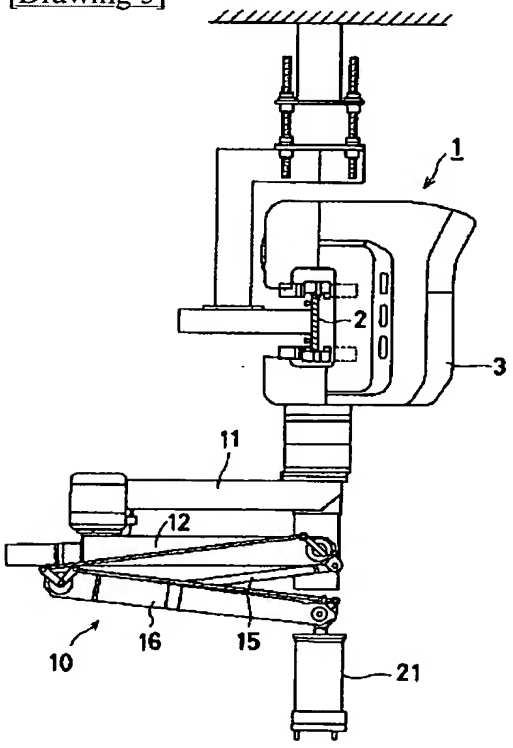
[Drawing 3]



[Drawing 4]



[Drawing 5]



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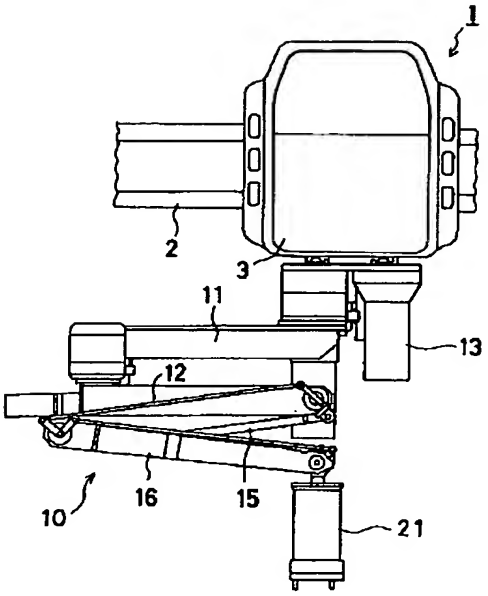

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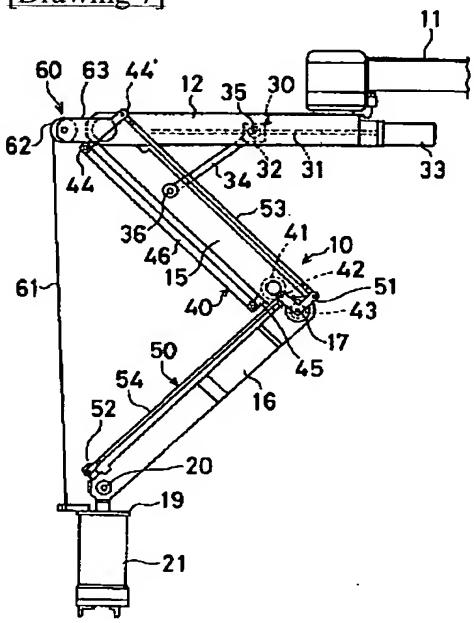
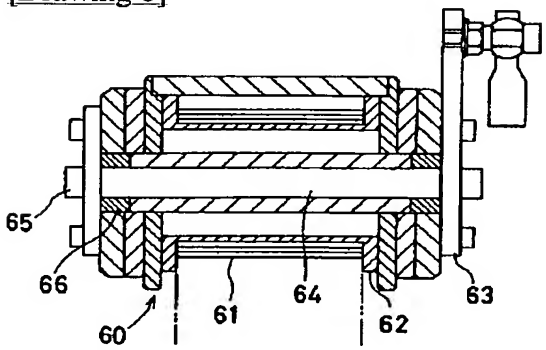
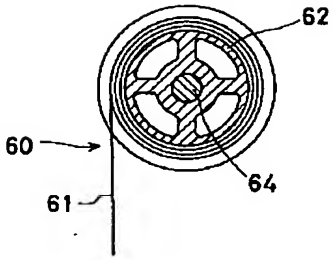


[Drawing 8]



[Drawing 9]



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